

Higher Mathematics – Homework 4

1. The rate of change of the function $f(x) = 6x^2 - x^3$ when $x = 2$ is

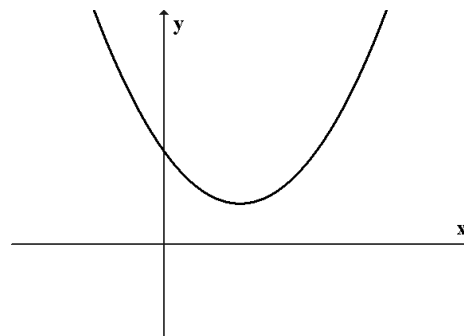
A 16

B 12

C -12

D 0

2. The graph in the diagram opposite could be that of the function



A $x^2 - 4x + 3$

B $x^2 + 4x + 4$

C $x^2 + 3x - 3$

D $x^2 - 3x + 4$

3. The solution to $\sqrt{3} \sin x = \cos x$ where $0^\circ \leq x^\circ \leq 180^\circ$ is

A 120°

B 30°

C 150°

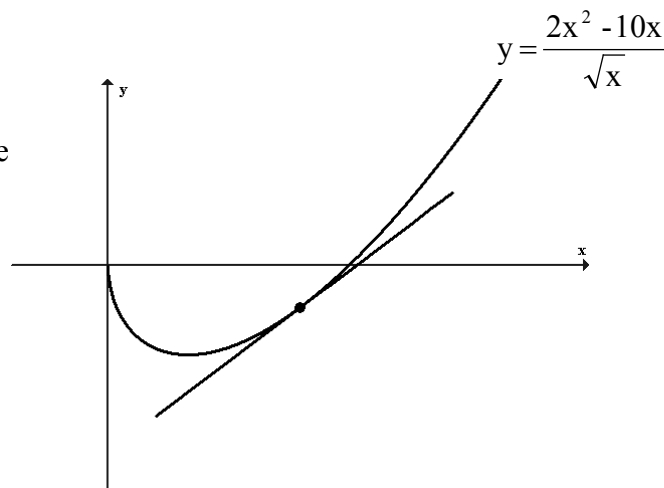
D 60°

4. Find the equation of the perpendicular bisector of the line joining the points $(-2, 4)$ and $(6, 0)$.

5. Find the equation of the tangent to the curve

$$y = \frac{2x^2 - 10x}{\sqrt{x}}$$

at the point where $x = 4$.



6. A recurrence relation is defined as $u_{n+1} = au_n + 4$ $u_0 = 2$

(a) Given the limit of this relation is 10, find a .

(b) Calculate the value of u_4 .

7. ABCD is a parallelogram whose diagonals meet at E.

A is the point $(-2,2)$, B is $(0,2)$ and E is $(2,0)$.

Find the equation of the line CD.

8. A curve is defined by $y = x^3 - 4x^2 - 3x + 2$.

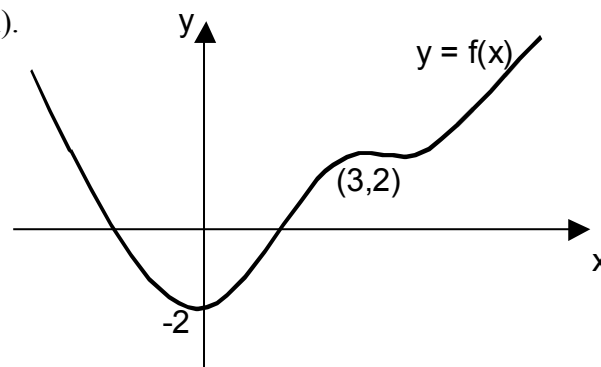
Find the stationary points of the curve and determine their nature.

9. The diagram opposite shows part of the graph of $y = f(x)$.

$f(x)$ has stationary points at $(0,-2)$ and $(3,2)$.

On separate diagrams make sketches of

- (i) $y = -f(x-2)$ (ii) $y = f'(x)$.



10. $f(x) = \sqrt{2}x - 3$ and $g(x) = \sin 2x + \sqrt{2}$

(a) Show that $f(g(x)) = \sqrt{2} \sin 2x - 1$

(b) Hence solve $f(g(x)) = 0$ for $0 \leq x \leq 360$

11. Find the values of x for which the function $f(x) = x^3 + x^2 - 5x + 6$ is increasing.

12. (a) Find the gradient of the tangent to the parabola $y = \sqrt{3}x - x^2$ at the point $(0,0)$.

(b) Hence calculate the size of the angle between the line $y = x$ and this tangent.

